

THE ALOHA SYSTEM	Project: ATS-1	CCG/G-36	14 pages
Title: ALOHA ATS-1 MODEM INTERFACE SPECIFICATION		General	
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1. Scope

This specification defines interface connections between the ALOHA ATS-1 Modem, Data Terminal Equipment, and radio transceiver equipment. It defines:

Section 2. - Data Equipment Interface Characteristics

Electrical Signal Characteristics, Interface Mechanical Characteristics, and Functional Description of Interchange Circuits.

Section 3. - Radio Transceiver Equipment Interface Characteristics

Electrical Signal Characteristics, Interface Mechanical Characteristics, and Functional Description of Interchange Circuits.

2. Data Equipment Interface Characteristics

2.1 General

This section defines the basic interface characteristics of interchange circuits between the ALOHA ATS-1 modem and the data equipment.

2.2 Categories

The interchange circuits between the data equipment and the modem fall into four general categories.

Ground or Common Return

Data Circuits

Control Circuits

Timing Circuits


2.3 Mechanical Characteristics

The interchange circuits shall be interconnected between the data equipment and the modem by means of a sixteen-pin DIP connector which shall plug into the modem circuit board so as to make contact at pin positions TA17-23 and TA40-46.

These pin assignments are shown in Figure 1.

2.4 Electrical Signal Characteristics, General

2.4.1 Interchange circuits transferring data, control, or timing signals across the interface point shall provide or accept TLL-compatible voltages as shown in the following table:



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Notation	Interchange Voltage	
	0 - 0.4 Volts	2.4 - 5.5 Volts
Binary State	0	1
Signal Condition	Spacing	Marking
Function	OFF	ON

Input and output currents across the interface point shall be compatible with the requirements for series 74 Transistor-Transistor-Logic.

2.4.2 Interchange circuits transferring data signals across the interface point shall hold marking (binary ONE) or spacing (binary ZERO) conditions for the total nominal duration of each signal element.

2.4.3 Interchange circuits transferring data signals across the interface point shall change state from a marking (binary ONE) or spacing (binary ZERO) condition only at the instant when the associated timing circuit changes state from an OFF to an ON condition.

2.4.4 Interchange circuits transferring timing signals across the interface point will hold ON and OFF conditions for nominally equal periods of time.

2.5 Interchange Circuits

Circuit GND - Signal Ground

Direction: Not Applicable

Mechanical: Pin TA17

This conductor establishes the common ground reference potential for all interchange circuits between the modem and the data equipment.

Circuit SDA - Transmitted Data

Direction: TO modem

Mechanical: Pin TA18

Signals on this circuit are generated by the data equipment and transferred to the modem for transmission of data to remote data equipment.

The data terminal equipment shall hold circuit SDA (Transmitted Data) in spacing (binary ZERO) condition at all times when no data are being transmitted.

The data terminal equipment shall not transmit data unless an ON condition is present on the following three circuits:

1. Circuit SR (Request to Send)
2. Circuit CST (Clear to Send Transmitter)
3. Circuit CS (Clear to Send)

All data signals that are transmitted on interchange Circuit SDA (Transmitted Data) across the interface shall change state from a marking (binary ONE) or spacing (binary ZERO)

condition only at the instant when Circuit ϕT (Transmitter Signal Element Timing) changes state from an OFF to an ON condition.

Circuit RDA - Received Data

Direction: FROM modem

Mechanical: Pin TA44

Signals on this circuit are generated by the modem in response to data signals received from remote data equipment via the remote modem. Circuit RDA (Received Data) will be held in the spacing (binary ZERO) condition at all times when Circuit RG (Receive Gate) is in the OFF condition.

All data signals that are transmitted on interchange Circuit RDA (Received Data) across the interface will change state from a marking (binary ONE) or spacing (binary ZERO) condition only at the instant when Circuit ϕR (Receiver Signal Element Timing) changes state from an OFF to an ON condition.

Circuit SR - Request to Send

Direction: TO modem

Mechanical: Pin TA21

This circuit is used to condition the modem for data transmission. The ON condition maintains the modem in the transmit mode. The OFF condition maintains the modem in the non-transmit mode.

A transition from OFF to ON instructs the modem to enter the transmit mode. The modem responds by turning on the radio transmitter and waiting for an interval sufficient to ensure that the remote receiving modem is synchronized to its input carrier signal. At the end of the transmitting modem's time-out interval, it will turn ON Circuit CS (Clear to Send), thereby indicating to the data equipment that data may be transferred across the interface point on interchange Circuit SDA (Transmitted Data).

A transition from ON to OFF instructs the modem to complete the transmission of all data which was previously transferred across the interface point on interchange Circuit SDA and then assume a non-transmit mode. The modem responds to this instruction by turning OFF Circuit CS (Clear to Send) and is then prepared to again respond to a subsequent ON condition of Circuit SR. When Circuit SR is turned OFF, it shall not be turned ON again until circuit CS has been turned OFF by the modem.

The transition from ON to OFF shall occur only at the instant when Circuit ϕT (Transmitter Signal Element Timing) changes state from an OFF to an ON condition.

Circuit CS - Clear to Send

Direction: FROM modem

Mechanical: Pin TA19

Signals on this circuit are generated by the modem to indicate whether or not it is ready to transmit.

The ON condition together with the ON condition on interchange Circuits SR (Request to Send) and CST (Clear to Send, Transmitter) is an indication to the data equipment that signals presented on Circuit SDA (Transmitted Data) will be transmitted to the communication channel. The OFF condition is an indication to the data equipment that it should not transfer data across the interface on interchange Circuit SDA.

The ON condition of Circuit CS is a response to the occurrence of a simultaneous ON condition on Circuit SR (Request to Send) and Circuit CST (Clear to Send, Transmitter). The ON condition of Circuit CS occurs approximately 100 bit durations after the simultaneous occurrence of ON conditions of Circuit SR and Circuit CST. This delay duration provides an adequate time period for the receiving modem to synchronize to the incoming carrier signal.

The transition from OFF to ON of Circuit CS will occur simultaneously with the transition from OFF to ON of Circuit ϕT (Transmitter Signal Element Timing).

The transition from ON to OFF of Circuit CS will occur simultaneously with the transition from ON to OFF of either Circuit SR or Circuit CST.

Circuit RG - Receive Gate

Direction: FROM modem

Mechanical: Pin TA46

The ON condition of this circuit is presented to the data equipment when the modem is receiving a signal suitable for demodulation.

The OFF condition indicates that no signal is being received or that the received signal is unsuitable for demodulation.

The OFF condition of Circuit RG will cause Circuit RDA (Receive Data) to be clamped to the spacing (binary Zero) condition.

The transition from OFF to ON or ON to OFF of Circuit RG will occur simultaneously with the transition from OFF to ON of Circuit ϕ R (Receive Signal Element Timing).

Circuit ϕ T (Transmitter Signal Element Timing)

Direction: FROM modem

Mechanical: Pin TA22

Signals on this circuit are used to provide the data equipment with transmitted signal element timing information.

Timing information on this circuit will be provided at all times.

The ON to OFF transition will indicate the center of each signal element on Circuit SDA (Transmitted Data).

Circuit ϕ R (Receiver Signal Element Timing)

Direction: FROM modem

Mechanical: Pin TA45

Signals on this circuit are used to provide the data equipment with received signal element timing information. The transition from ON to OFF condition will indicate the center of each signal element on Circuit RDA (Received Data). Timing information on this circuit will be provided at all times.

3. Radio Transceiver Equipment Interface Characteristics

3.1 General

This section defines the basic interface characteristics of interchange circuits between the ALOHA ATS-1 modem and the radio transceiver equipment.

3.2 Categories

The interchange circuits between the radio transceiver equipment and the modem fall into three general categories:

Ground or Common Return

Control Circuits

Baseband Signal Circuits

3.3 Mechanical Characteristics

The interchange circuits shall be interconnected between the radio transceiver equipment and the modem by means of the same sixteen-pin DIP connection described in paragraph 2.3 of this specification. The pin assignments are shown in Figure 1.

3.4 Electrical Signal Characteristics, General

3.4.1 Interchange circuits transferring control signals across the interface point shall provide or accept TTL - compatible voltages as described in paragraph 2.4.1 of this specification.

3.4.2 Interchange circuits transferring baseband signals across the interface point shall provide or accept suitable baseband carrier signals as described in the paragraphs on Transmitter Baseband Signal and Receiver Baseband Signal.

3.5 Interchange Circuits

Circuit GND - Control Signal Ground

Direction: Not Applicable

Mechanical: Pin TA23

This conductor establishes the common ground reference potential for all control signal interchange circuits between the modem and the radio transceiver equipment.

Circuit GND - Baseband Signal Ground

Direction: Not Applicable

Mechanical: Pin TA40

This conductor establishes the common ground reference potential for both baseband signal interchange circuits between the modem and the radio transceiver equipment. This ground is internally connected to the control signal ground within the modem and is provided as a convenient tie-point for baseband-signal cable shields.

Circuit SRT - Request to Send, Transmitter

Direction: FROM modem

Mechanical: Pin TA20

This circuit provides a control signal used to turn on the radio transmitter in the radio transceiver equipment. This circuit operates at TTL levels. The ON condition maintains the radio transmitter in the transmit mode. The OFF condition maintains the radio transmitter in the non-transmit mode.

A transition from OFF to ON occurs simultaneously with the transition from OFF to ON of Circuit SR (Request to Send).

A transition from ON to OFF occurs simultaneously with the transition from ON to OFF of Circuit SR.

Circuit CST - Clear to Send, Transmitter

Direction: TO modem

Mechanical: Pin TA43

This circuit provides a control signal from the radio transceiver equipment to the modem to indicate whether or not the radio transmitter is ready to transmit. This circuit shall provide signals at TTL levels.

The ON condition of Circuit CST together with the ON condition on interchange Circuit SR (Request to Send) is an indication to the modem that the radio transmitter is ready to transmit and that the modem may initiate its Clear to Send time-out function.

The transition from OFF to ON may occur after a necessary time delay following the transition from OFF to ON of Circuit SRT.

The transition from ON to OFF may occur after a necessary time delay following the transition from ON to OFF of Circuit SRT.

Circuit CST shall maintain the ON condition for the entire duration of the ON condition of Circuit SRT, except for the necessary state transition delay described above.

Circuit CST shall maintain the OFF condition at any time Circuit SRT is in the OFF condition, except for the necessary state transition delay described above.

Circuit XMT - Transmitter Baseband Signal

Direction: FROM modem

Mechanical: Pin TA42

The signal on this circuit is a differentially bi-phase-modulated sinusoidal carrier waveform which has been pre-emphasized for input into a typical \pm one radian phase modulator of an FM radio transmitter.

The signal output amplitude in the spacing (binary ZERO) condition is 0.4 volts, peak (0.24 volt, r.m.s.).

The signal source impedance is low, but is current limited to \pm 5 milliamperes, peak.

The radio transmitter shall be capable of being adjusted to to an FM peak deviation of \pm 9 KHZ when a spacing (binary ZERO) condition transmitter baseband signal is presented to the radio transmitter input circuit.

The radio transmitter baseband circuits between the signal input and the phase modulator shall provide no filtering or limiting of the transmitter baseband signal which will cause amplitude or phase distortion of the baseband signal. A d.c. decoupling capacitance may be used, provided the a.c. coupling time-constant is such that no appreciable distortion is introduced into the signal. The time-constant shall be no greater than ten bit-time intervals.

Circuit RCV - Receiver Baseband Signal

Direction: TO modem

Mechanical: Pin TA41

The signal on this circuit is a differentially bi-phase-modulated and pre-emphasized sinusoidal carrier waveform derived from the FM detector of the FM radio receiver.

The FM detector of the radio receiver shall provide no de-emphasis of the received signal since this function is performed within the modem.

The FM detector of the radio receiver shall provide the signal to the modem baseband receive input through a d.c. decoupling capacitance and series resistance so as to provide a minimum input current of five microamperes r.m.s. at the modem carrier frequency. The RC time-constant shall be approximately five bit-time intervals. The modem baseband receive input impedance is very low since it constitutes the input summing point of an operational amplifier.

INPUT/OUTPUT
CONNECTOR

23	22	21	20	19	18	17
GND	ϕ_T	SR	SRT	CS	SDA	GND
RG	ϕ_R	RDA	CST	XMT. SIG. OUT	RCV. SIG. IN	GND
46	45	44	43	42	41	40

TA

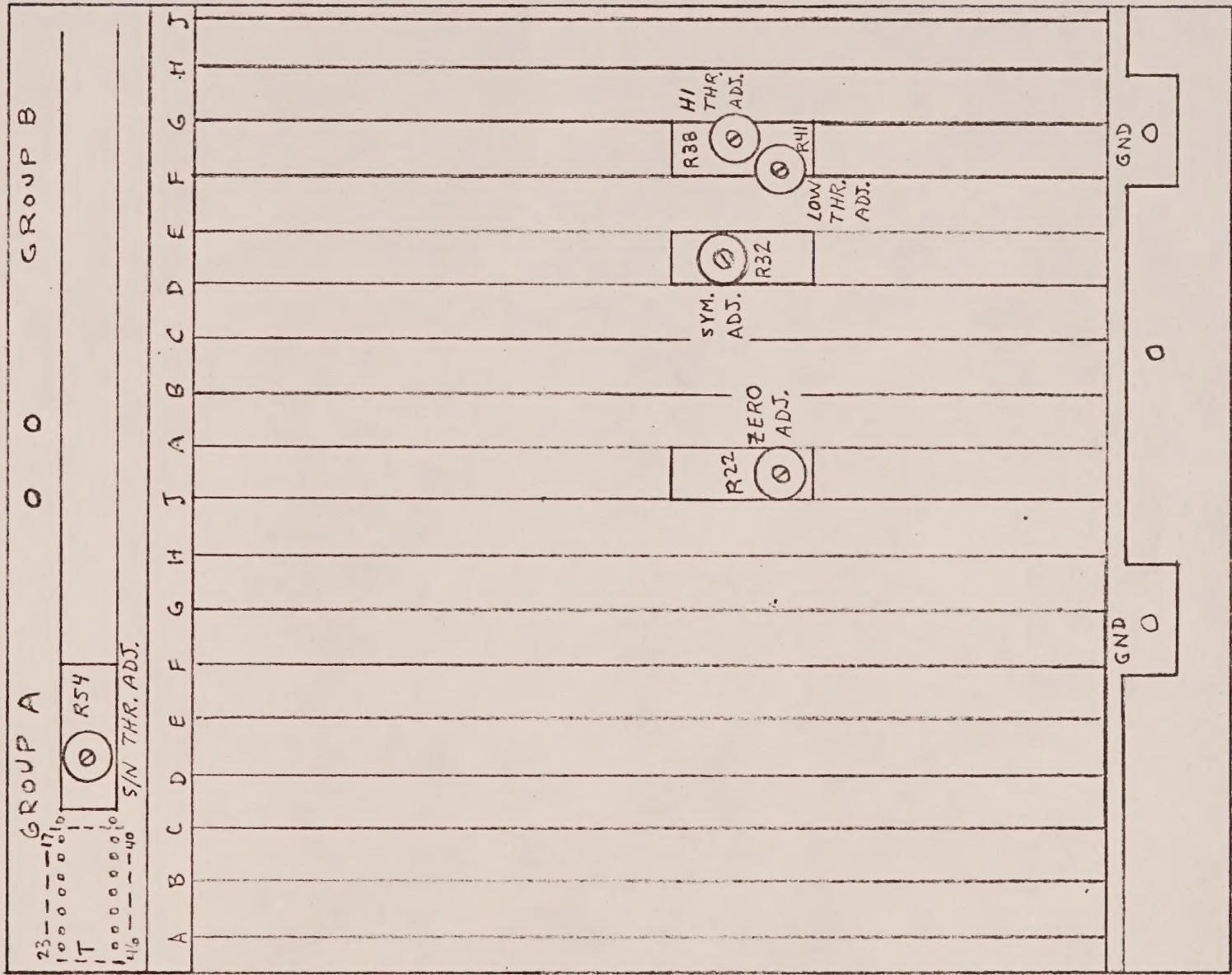


FIGURE 1

